Toilet Seat Fitting

The present invention relates to a fitting for fixing a toilet seat to a toilet pan.

Toilet pans are conventionally provided with a pair of apertures at the rear of the toilet pan for the purpose of fixing a toilet seat to the toilet pan. The conventional fitting provided on the toilet seat for fixing to the respective apertures is a simple screw and nut, the screw extending from a large head. For fixing the toilet seat, the screw is inserted into the aperture in the toilet pan so that the head rests on the upper surface of the toilet pan. Then, the nut is fixed to the screw from beneath the toilet pan and tightened against the lower surface of the toilet pan.

Such a conventional fitting has the benefit that the toilet seat can be fixed securely to the toilet pan in a relatively straightforward manner. However, although attachment of the fitting is simple, it can be unduly time-consuming and awkward, particularly when the toilet pan is arranged in a position which makes the lower end of the aperture difficult to access, for example if the toilet is close to a wall. Also, over time the nut can become loose. Thus, unless the nut is periodically re-tightened, the toilet seat can become unstable on the toilet pan. For the user, movement of the toilet seat is uncomfortable and can even be dangerous, particularly for young children and the infirm.

It would be desirable for the fitting to be capable of fixing to the toilet pan more easily.

According to the present invention, there is provided a fitting for fixing a toilet seat to a toilet pan, the fitting comprising a post for insertion into an aperture in the toilet pan, the outer portion of the post being formed of resilient material arranged to frictionally engage the inner circumferential surface of the aperture.

Such a fitting is very easy to fix to a toilet pan, because it is simply necessary to insert the post into the aperture in the toilet pan with enough force to overcome the frictional engagement between the outer portion of the post and the inner circumferential surface of the aperture. This compresses the resilient material of the outer portion of the post. Thereafter, the post is retained in the aperture in the toilet pan by the friction engagement without the need for any other means of attaching the

fitting to the toilet pan, such as a nut screwed to the lower end of the post. In particular, it is not necessary to access the lower surface of the toilet pan which can sometimes be inconvenient and awkward. Furthermore, the fitting does not become loose over time because the outer portion of the post can engage the aperture without the need for moving parts.

Desirably, the outer portion of the post is formed of material having a Shore hardness of from 20 A to 70 A, preferably from 30 A to 50 A and most preferably around 40 A. Such resilience as measured by the Shore hardness has been found to provide a secure fixing of the fitting to the toilet pan.

Desirably, the outer portion of the post extends over a distance of at least 12mm, preferably at least 18mm and most preferably around 30mm. Apertures in a toilet pan have a typical depth of the order of 18mm and so this size for the outer portion of the post provides the advantage of engaging the apertures in the toilet pan over a significant part of the depth of the aperture, thereby providing stablility.

Advantageously, the outer portion of the post comprises a plurality of engagement members protruding sideways relative to the direction of insertion into the aperture in the toilet pan.

Although the outer portion of the post could alternatively be formed as a solid block of material, the use of plurality of engagement members provides advantages as follows. In such an arrangement the resilient nature of the engagement members means they are deflectable on insertion of the post into the aperture. This provides the significant advantage that the post can accomodate a range of differently sized and shaped apertures. Apertures in toilet pans are normally manufactured with very low tolerances and so are of varying sizes and shapes. Variations in the radius are of the order of 2mm between different toilet pans, and the apertures are often oval rather than round. However the deflection achievable with a plurality of protruding engagement members allows such variations to be accommodated whilst maintaining a secure fixing of the fitting to the toilet pan. In addition, the deflection of the engagement members within the aperture causes them to be urged by their own resilience against the inner surface of the aperture which increases the contact force

normal to the contact surfaces and hence increases the frictional force therebetween.

Advantageously, the engagement members are arranged to provide a greater frictional force against movement in a direction opposite to the direction of insertion than against movement in the direction of insertion.

In order to securely fix the toilet seat to the toilet pan, in the direction opposite to the direction of insertion, it is desirable to have a high frictional force against movement of the post out of the aperture. However, by providing a relatively lower frictional force against movement in the direction of insertion, the post may still be easily inserted into the aperture, thereby providing for easy fixing. To so control the relative frictional forces against movement out of the aperture, the engagement members may be resiliently deflectable rearwardly and /or the engagement members may have a front surface which is inclined rearwardly.

Preferably, the engagement members extend around the post, preferably continuously. This maximises the surface area for frictional engagement between the inner surface of the aperture and the post. It also limits sideways movement of the toilet seat fixed by a pair of fittings because the fittings may not move sideways.

Desirably, the engagement members have an outer surface which extends parallel to the direction of insertion for frictionally engaging the inner circumferential surface of the aperture. By providing such a surface, it is possible to maximise the frictional force developed by each member.

Desirably, the engagement members have a thickness at the their outer edge in the direction of insertion of at least 1mm. This increases the area of contact between the members and the inner surface of the aperture, thereby increasing the frictional force developed.

The post may comprise a central rod from which the engagement members protrude. This is a form which is convenient to manufacture, because the rod may be moulded in a first step and the engagement members over-moulded to the rod in a subsequent step.

In this case, the rod is preferably formed from a material which is more rigid than the engagement members. This provides the post with a high rigidity which

assists in securely fixing the fitting to the aperture by maintaining the frictional contact along the entire length of the post.

Preferably, the fitting further comprises a head from which the post extends, the head extending further than the post sideways relative to the direction of insertion of the post for engaging the toilet pan around the aperture.

By coming into contact with the toilet pan around the aperture, the head limits the travel of the fitting on insertion into the aperture and therefore assists easy fixing of the fitting. The engagement between the head and the toilet pan also increases the strength of the fixing in a simpler manner to a conventional toilet seat fitting.

Advantageously, the head may have a resilient sucker facing the direction of insertion for engaging the surface of the toilet pan in which the aperture is formed. Such a resilient sucker assists in seating the head on the toilet pan and limits the amount of sideways motion of the fitting, thereby assisting in providing secure fixing of the fitting.

Typically, the fitting will be provided with a hinge portion for pivotally coupling the fixing to an annular seat member of a toilet seat. This allows the toilet seat to be raised in a conventional manner.

Usually, the toilet seat fitting will be provided coupled to the annular seat member of a toilet seat, although in principle it could be provided separately and coupled to the annular seat member by the user.

To allow better understanding, a toilet seat fixing which embodies the present invention will now be described by way of non-limitative example with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of a toilet pan and a toilet seat having a pair of fittings in accordance with the present invention;

Fig. 2 is a rear view of one of the toilet seat fittings;

Fig. 3 is a side view of the toilet seat fitting of Fig. 2;

Fig. 4 is a cross-sectional view taken along the line IV-IV in Fig. 3 of the fitting of Figs. 2 and 3 coupled to the toilet seat and fitted in the toilet pan, the toilet seat and toilet pan being shown partially; and

Fig. 5 is a rear view of a toilet seat fitting of modified form.

Fig. 1 shows a toilet seat 1 having a pair of fittings 2, 3 in accordance with the present invention. The toilet seat 1 comprises an annular seat member 4 and a lid 5 which are pivotally coupled together to allow the lid 5 to be raised (as shown in Fig. 1) or lowered to cover the annular seat member 4. The form of the annular seat member 4 and the lid 5 are in themselves conventional.

The fittings 2, 3 are mirror images of each other, one fitting 2 being shown in Figs. 2 to 4. The fittings 2 each comprise a head 6 and a post 7. The respective fittings 2, 3 may be fixed to a toilet pan 8 simply by insertion of the post 7 along the direction of insertion A in which the post 7 extends into apertures 9 provided in an upper surface 10 at the rear of the toilet pan 8. The head 6 extends sideways relative to the direction of the insertion further than the post 7 and in particular is larger than the aperture 7. Thus, the lower surface 19 of the head 6 contacts the upper surface 10 of the toilet pan 8 around the aperture 9 to limit the travel of the fittings 2, 3. Optionally, a seal (not shown) made of a resilient material may be provided between the lower surface 19 of the head 6 and the upper surface 10 of the toilet pan 8 in a conventional manner.

Each head 6 is provided with a cylindrical stub axle 11 on the side of the head relative to the direction of insertion A. The stub axles 11 are mounted in corresponding cylindrical bearing recesses 12 provided in the annular seat member 4. Thus the stub axles 11 each act as a hinge portion for pivotally coupling the respective fitting 2, 3 to the annular seat member 4 of the toilet seat 1.

The posts 7 of the fittings 2, 3 will now be described.

The post 7 comprises a central, cylindrical rod 13 extending along the direction of insertion A.

The outer portion of the post 7 is constituted by a plurality of engagement members 14 which protrude outwardly from the central rod 13 that is sideways relative to the direction of insertion A. The engagement members 14 each have the same size and configuration, being annular flanges and extending continuously around the post 7. The engagement members 14 each have a front surface 17 inclined

rearwardly relative to the direction of insertion A, that is upwardly in Fig. 4 and an outer circumferential surface 16 which extends parallel to the direction of insertion A. The thickness of the engagement members 14 at their outer edge, that is the length of the outer circumferential surface 16 is at least 1mm, preferably 1.5mm.

The engagement members 14 are larger in the direction perpendicular to the direction of insertion A than the diameter of the aperture 9 of the toilet pan 8. Typically, the aperture 9 will be around 13mm to 15mm in diameter and so the engagement members 14 for a typical application have a diameter of at least 15mm, preferably around 16mm.

Furthermore, the engagement members 14 are made of resilient material having a degree of resilience sufficient to allow the engagement members 14 to be deflected rearwardly relative to the direction of insertion A (that is upwardly in Fig. 4) by insertion of the post 7 into the aperture 9. In general, to achieve this the engagement members 14 are made of a resilient material having a Shore hardness in the range from 20 A to 70 A, preferably from at least 30 A and/or to at most 50 A and most preferably around 40 A.

Thus, on insertion of the post 7 into the aperture 9, the engagement members deflect rearwardly so that both a portion of the front surface 17 and the outer circumferential surface 16 of the engagement members 14 are in contact with the inner circumferential surface 15 of the aperture 9. This creates a frictional force between the fittings 2, 3 and the toilet pan 8 against movement of the post 7 along the direction of insertion and along the opposite direction.

Furthermore, as a result of the deflection of the resilient members 14 within the aperture 9, the resilience of the engagement members 14 urges them outwardly. This increases the contact force between the engagement members 14 and the inner circumferential surface 15 of the aperture 9 normal to those surfaces 15 and 16, which in turn increases the frictional force against movement of the posts 7 relative to the toilet pan 8. If force is applied to remove the fittings 2, 3 in the direction opposite to the direction of insertion A, then engagement members 14 are urged harder against the inner circumferential surface 15 of the aperture, so the contact

force and hence the frictional force are further increased.

Both the fact that the engagement members 14 are deflectable and the inclination of the engagement members 14 assist in providing a greater frictional force against movement in the direction opposite to the direction of insertion A than against movement in the direction of insertion A.

In the described fittings 2, 3, the length of the post 7 is 30mm and the pitch of the engagement members 14 is 6mm, as compared to the length of the inner circumferential surface 15 of the aperture 9 which is typically of the order of 20mm although there is variation between different toilet pans in practice. Thus the post 7 engages the inner circumferential surface 15 of the aperture 9 at plural positions over most of the entire length of the inner circumferential surface 15 of the aperture 9 . This provides a secure fixing for the fittings 2,3 in the aperture. In general, to provide such secure fixing over a significant length of the inner circumferential surface 15 of the aperture 9, it is preferred for the post 7 to include engagement members 14 spread over a distance of at least 12mm, preferably at least 18mm. To maximise the frictional force, it is preferred that there are at least three engagement members 14 over this distance. For similar reasons, it is preferred that the pitch of the engagement members is at most 10mm.

In addition, any engagement members 14 which pass out of the aperture 8 can also resist removal of the post 7 by engaging the lowermost rim of the aperture 8.

The rod 13 is made of a material which is more rigid than the engagement members 14. This provides the post 7 as a whole with increased rigidity and assists in maintaining the frictional contact between the engagement members 14 and the inner circumferential surface 15 of the aperture 9 along the entire length of the aperture 9.

The fittings 2, 3 are fixed securely in the apertures 9, not only by the contact between the engagement members 14 and the inner circumferential surface 15 of the apertures 9, but also by the engagement of the lower surface 19 of the head 6 against the upper surface 10 of the toilet pan 8. Also, the contact between the outer circumferential surfaces 16 of the posts 7 and the inner circumferential surface 15 of the apertures 9 limits movement of the fittings 2, 3 sideways relative to the direction

of insertion A.

The fittings 2, 3 may take a modified form as shown in Fig. 5, in which the head 6 is provided on its lower surface 19 with a resilient sucker 18 facing the direction of insertion A. Otherwise the modified form of the fittings 2, 3 is identical to that shown in Figs. 1 to 4. After insertion of the fittings 2, 3 into the apertures 9, the sucker 18 engages the upper surface 10 of the toilet pan 8. The suction between the sucker 18 and the upper surface 10 of the toilet pan 8 assists in holding the fittings 2, 3 in place and reduces sideways slippage. This improves the security of fixing.

The fittings 2, 3 are straightforward to manufacture by a two stage moulding technique. In a first stage, the head 6 and the rod 13 of the post 7 are unitarily moulded from a suitable material, preferably polypropylene. In a second stage, the engagement members 14 are over-moulded onto the rod 13. The material of the engagement members 14 is preferably a thermoplastic elastomer. This is suitable material to adhere to the rod 13 in the over-moulding stage and also has good frictional surface properties. In the case of the modified fittings 2, 3 of Fig. 5, the resilient sucker 18 is moulded simultaneously with the engagment members 14 and may be of the same material as the engagement members 14.